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ABSTRACT

A study was conducted at Prince George's Community College (PGCC), in Maryland, to evaluate nursing student performance from point of admission to the taking of the National Council Licensure Examination (NCLEX). A sample of 853 students who enrolled in the nursing program entry course between fall 1986 and spring 1992 were surveyed to determine progress and performance of developmental students, the relationship between placement test scores and NCLEX results, the effect of repeating courses on progress and performance, the effect of science aptitude and performance in biology prerequisites on nursing students outcomes, performance of transfers and students who "test out", and the number of students that should be accepted to the program to graduate 100 per year. Significant findings include the following: (1) nearly half the students avoided placement testing or failed to complete required developmental coursework; (2) among those needing remediation, completion of coursework yielded only modest gains in graduation probability; (3) a strong relationship was found between placement English scores and NCLEX pass rates, a fair relationship was found for reading scores, but no relationship was found for math scores; (4) while most students who repeated a nursing course passed it the second time, repeaters generally had trouble with the following course; and (5) to graduate an average of 100 students per year, 167 would have to enter the program annually. (KP)

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ED 371 805

Nursing Student Performance, 1986-1993:Preliminary Findings.

Karl Boughan

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Prince George Community College
Largo, MD.

PRINCE GEORGE'S COMMUNITY COLLEGE
Office of Institutional Research and Analysis

NURSING STUDENT PERFORMANCE 1986-1993: PRELIMINARY FINDINGS

Program Evaluation PE93-1
April 1993

Introduction

The Nursing Department is in the midst of planning a revision of its policies regarding student program admission and course prerequisites, sequencing and grading. The Office of Institutional Research and Analysis has been asked, in this connection, to conduct an evaluation of recent nursing student performance since Fall 1985 from point of program admission through to the taking of the National Council Licensure Examination (NCLEX) for registered nurse state certification. This study is now being conducted, but preliminary to the full forthcoming report we have also been requested to supply several critical early findings needed by the department for its current consultations with the College administration on its proposed program revisions. These will be found in this preliminary report.

Methodological Considerations

Two methodological questions had to be answered before analysis could begin. The first one was: *Who* is a nursing student? The question is not trivial since past OIRA research has indicated that registrar's records on curriculum choice often fail to reflect the actual courses of study students pursue at PGCC. Therefore, it was decided to use a "behavioral" definition of "nursing program student" for purposes of this study: Any student who, regardless of stated "major," attempted Nursing 151, the basic nursing program entry course, during or at any time following Fall 1986 was to be deemed a "nursing program student" and represented in our data set. Using this definition resulted in a sample of 853 students.

The second question was: What *sort of sample* should be used to gauge student nursing program progress? At first blush, this also seems trivial — why, all nursing students within the study period: in other words, the 853 just defined above. The logic of outcomes analysis, however, suggests that two different data sets are required for a comprehensive assessment. The full period sample is most appropriate when a research question focuses on a single "performance point" (e.g., How many complete the transition from Nursing 152 to Nursing 251? What distinguished those successful in transition from the failures?). But a special *cohort sample* is called for when attention shifts to *tracking* student progress across multiple program points (e.g., What does the nursing program retention curve look like? What percentage of students survive the whole process through graduation?).

An educational cohort is a subset of all students consisting only of those who simultaneously embarked upon a course of study (e.g. first time Fall 1986 Nursing 151 enrollees). Often further excluded from membership in a cohort are any with important previous outside experience in the field to be studied (e.g., nursing program transfer students from other schools, former practical nurses or para-medics "testing out" of Nursing 151 by "challenge examination"). The advantage of the cohort approach is unambiguous outcome measurement. Students sharing a cohort all begin at exactly the same starting gate (school and program entry semester), and once the "race" has begun, the performance of each in any "lap" (subsequent semester) can be fairly matched with that of his or her fellow "contestants" since no one has set off any earlier or later than anyone else. Also, the results of the whole race — how many crossed the finish line (graduated, passed the NCLEX)? — can be unconditionally assessed. Whereas the interpretation of a PGCC nursing program final outcome percentage based on the full 853 student data would be muddled by multiple study spans and in some instances non-PGCC starting venues.

In this study, we defined a "cohort" as consisting of all *non-transfer*[1] students who entered the PGCC nursing program (i.e., took Nursing 151 for the first time) during the *same semester*[2]. Thus there are 12 cohorts in our base sample of nursing students, one for each of the study interval "semesters" Fall 1986-Spring 1992. Outcomes assessment points were set at two years or four semesters from program entrance (by course sequence design, the ideal period for program completion), and also at three years (six semesters) and four years (eight semesters) as representing more realistic study time spans. This also allowed us conveniently to aggregate *entrance cohorts* into three larger *assessment cohorts* based on shared assessment intervals. Thus the Year 2 cohort included all entrance cohorts (Fall 1986-Spring 1991; n=604) with at least four semesters of study opportunity before the research cut-off of Spring 1993. The Year 3 cohort embraced students entering the program Fall 1986-Spring 1990 (n=485); cohort Year 4 took in Fall 1986-Spring 1989 (n=352).

Nursing Department Questions

1. What has been the progress and performance of students in the nursing program who have taken developmental programs?

To answer this question in full detail would take a small book. The developmental program at PGCC is complicated in the extreme. There are three separate developmental areas (reading, English and mathematics) and a student may qualify for work in all or any combination of them. And there are literally dozens of possible permutations in the ways students can work through the process, test out of it, ignore it or "illegally" slip around it. Even the developmental testing stage is a baroque affair for there are several different examination forms in each area which may used to assess a student's need for remedial work depending upon the level of her initial college preparedness and the timing of her first enrollment at PGCC. Because of the need for brevity here, we have for better or worse boiled all of the above down to one overly simple summary variable: Tested into one or more areas and completed the indicated developmental program/Tested into one or more areas but did *not* complete the program/Took the test(s) but demonstrated *no need* for remedial work/Was not required or chose not to take any developmental test. The table below shows how the nursing students in our sample (excluding transfers-in and "challenge" students) distributed on this variable:

Took Developmental Test(s)/No Need Indicated ...	45 %	(357)
Requiring & Completing Remediation	9 %	(70)
Required in 1 Area Only	7 %	(55)
Required in 2 or 3 Areas	2 %	(15)
Requiring but NOT Completing all Needed Areas ..	30 %	(237)
Completing a Part of the their Total Program ...	6 %	(47)
Completing No Part of their Program	24 %	(190)
Took No Developmental Tests	16 %	(129)
TOTAL	100 %	(793)

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[1] In this context, a "transfer student" refers to any student who has transferred into the PGCC program *nursing course credits* from another school (or by analogy who has managed to translate some practical medical experience through a "challenge" examination into passing credit in NUR151). For our cohort-defining purposes, an included student may in fact be a "transfer student" in the normal sense so long as all of his or her nursing course credits counting towards a PGCC *nursing degree* were derived from PGCC course-taking. Students excluded by the above definition were 46 transferring in nursing credits from outside and 14 entering the PGCC nursing program by challenge examination.

[2] In this report, each academic year will be divided into two "semesters": Fall (Fall term plus Summer II term) and Spring (Spring term plus Summer I term).

The most important thing these data tell us is that the nursing department policy that no student testing into the developmental program be admitted to the nursing program before she completes all her remedial work is frequently honored only in the breach. For to qualify for this research sample, a student must have been enrolled in Nursing 151, the program entrance course, sometime between Fall 1986-Fall 1992; yet 30 percent did not in fact complete their developmental requirements before taking Nursing 151.

Furthermore, 16 percent proved to have gone through no developmental testing at all. While a small minority of PGCC students "qualify out" of developmental testing by otherwise demonstrating basic academic skills (e.g., adequate SAT scores), the great majority avoiding developmental testing do so without making any such demonstration. Because proof of basic skills is a requirement made by most academic departments at PGCC (including Nursing) before enrollment in most academic program courses is allowed, such students in effect choose to disqualify themselves from studying towards a degree. The majority of the 16 percent above must have fallen into the "No Developmental Testing/No Skills Demonstration" category; yet at some point since 1986 the department has allowed them to study toward a Nursing A.A. In short, nearly half of the 1986-1992 crop of nursing students should not actually have been let into the program according to current department policy.[3]

How did these four developmental program-defined groups of nursing students perform?:

NURSING STUDENT OUTCOMES BY DEVELOPMENTAL NEED (Column Percents)

	Dev Courses Required				
Assessed:	Incomplete	Complete	No Need	No Tests	ALL
End Year 2					
Dropout*	28	27	28	20	27
Continuing**	42	42	33	41	38
Graduate***	30	31	39	39	36
	(211)	(45)	(277)	(71)	(604)
End Year 3					
Dropout	32	34	30	26	31
Continuing	14	9	12	12	12
Graduate	54	57	58	62	57
	(183)	(35)	(225)	(42)	(485)
END YEAR 4					
Dropout	37	32	35	17	35
Continuing	5	4	5	0	5
Graduate	59	64	60	83	61
	(147)	(25)	(168)	(12)	(352)

* No graduation by Assessment Date; No courses (through Spring 1993) after Assessment Date
** No graduation by Assessment Date; Course(s) after Date
*** Graduation by Assessment Date

[3] It might also be pointed out that it is likely that some of the students in the 54 percent apparently "within policy" actually were also outside the bounds. Past OIRA research into the developmental process has established that not infrequently students undergo developmental testing selectively, omitting one or two examination areas.

When graduation rate is assessed early (end of Year 2), the results are no significant difference between development program nursing students who completed remediation and those who did not (30 to 31 percent respectively) but there was a modest tendency for all developmental students to lag behind non-developmental students (8-9 percent). On other major outcomes, among the three test-taking groups no real differences could be found for dropout rate (all between 27-28 percent) but developmental students did seem somewhat more likely to end up in the "continuing" category (both developmental complete and incomplete categories — 42 percent) compared with "tested out" students (33 percent). Students not required to take the placement tests, or who simply ignored them, were in an undramatic way the most successful group at the end of four semesters of study — 7 percent lower than the next lowest group in dropout rate and tieing for first (with the "tested-outs") for highest graduation rate (39 percent).

When, however, major outcomes are assessed late (e.g., end of Year 4), all differences tend to be minimized. Both dropout (32-37 percent)and graduation rates (59-64 percent) fall into trivially narrow ranges across the three groups for which sufficient numbers remained to produce stable percentage estimates (only 12 no-test students could be assessed through 8 semesters). Which goes to show that persistence pays off and that those developmental students who stick it out eventually pretty much catch up in the end. But it also goes to show how little impact, among developmental students, actually completing the required developmental sequence actually has upon determining major nursing program outcomes.

Also, developmental course-taking history had little impact on degree-earning time. All groups, as can be easily seen in the table below, put in on average nearly identical amounts of time in achieving their nursing A.A.s (around 4.8 semesters at Year 4's assessment).

GRADUATE NURSE SEMESTER STUDY SPAN

Assessed Year 4:	Mean#	N
All	4.80	(213)
Nursing A.A./Developmental	4.81	(102)
Completed	4.75	(16)
Did not Complete	4.83	(86)
Nursing A.A./Non-Developmental	4.78	(111)
Tested Out	4.78	(101)
Took no Tests	4.80	(10)
Dev.-NonDev. Semester Study Span	.03	--

Still, this is not to say that needing remediation and whether one gets it is without some notable effects. For one, as the next table shows, there is a slight but perhaps not unimportant difference made in the number of core nursing program courses completed by those not attaining an A.A. at the point of outcome assessment. Assessed at Year 2, students requiring remediation completed on average between a tenth to one-third of a core course fewer than non-developmental students; and students satisfying their remediation requirements were about two-fifths of a course ahead of unfinished developmental students.

NURSING CORE COURSE COMPLETION

	All Non-Grads		Dropouts		Continuing	
Assessed Year 2:	Mean#	N	Mean#	N	Mean#	N
All	1.57	(389)	.64	(162)	2.24	(227)
Developmental Required	1.49	(178)	.45	(71)	2.19	(107)
Incomplete	1.45	(147)	.46	(59)	2.11	(88)
Complete	1.71	(31)	.42	(12)	2.53	(19)
No Developmental	1.64	(211)	.78	(91)	2.29	(120)
Tested Out	1.59	(168)	.70	(77)	2.34	(91)
No Tests	1.84	(43)	1.21	(14)	2.14	(29)
Dev.-NonDev. Comp. Courses	-.15	--	-.33	--	-.10	--

But the only really outstanding outcomes impact made by a student developmental history occurred beyond regular nursing program study at PGCC — at the licensing examination stage.

NURSING NCLEX PASS RATES

	Passing NCLEX		
	First Try	Any Try	N
All 1986-1992 Entering Students who went on to take NCLEX	86 %	95 %	(310)
Developmental Required	78 %	92 %	(129)
Incomplete	77 %	91 %	(108)
Complete	81 %	90 %	(21)
No Developmental	91 %	98 %	(181)
Tested Out	92 %	99 %	(146)
No Tests	89 %	96 %	(35)
Dev.-NonDev. % Passing NCLEX	-13 %	-6 %	--

The difference is far from drastic allowing for multiple examination attempts (92 percent of former remedial students ultimately passed, only 6 percent fewer than non-remedial students). However, shift to the first try indicator and the gap widens to a powerful 13 percent (former developmental students 78, non-developmental 91 percent). The trouble is that outside assessors have set a 90 percent *first attempt* pass rate as the standard of nursing program performance, and the PGCC NCLEX record in recent years has fallen short of this cut point, usually by 5 percent or more.

2. What has been the relationship between CGP placement test scores and NCLEX exam results over the past five years?

The PGCC system of developmental placement testing is too complex and our space is too limited to answer this question in full. But we can get a good, rough idea of how CGP scores and NCLEX performance interact by zeroing in on the three most widely taken exams — EC20 (English Usage), RC10 (Reading Comprehension) and MC50 (Math/Algebra Skills).

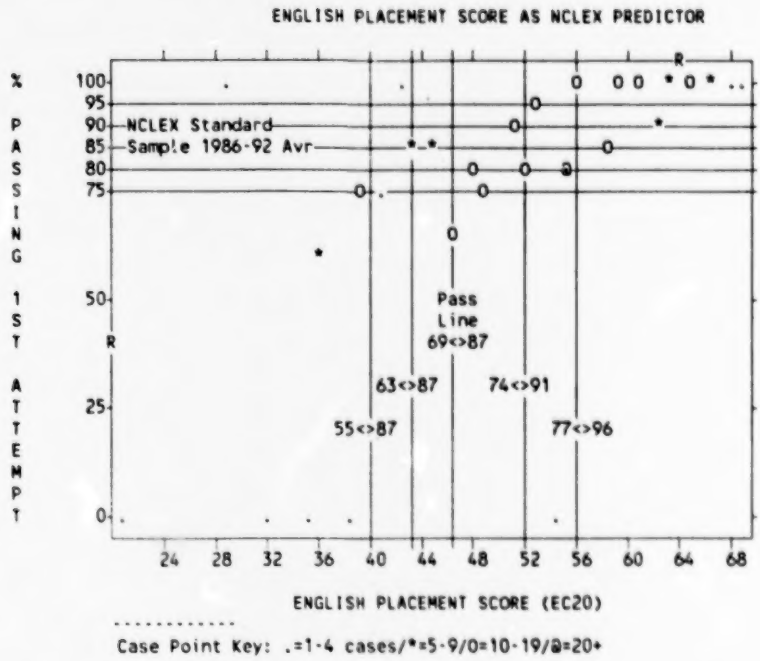
Below is a table showing the results of three bivariate regression analyses of NCLEX student raw scores on the three selected CGP tests against first try NCLEX results. Unfortunately, because NCLEX reporting is only in terms Pass/Fail we have been forced to use a "dummy" dependent variable (0/1) to represent NCLEX outcomes. Statistically, this means a weaker test of the CGP-NCLEX causal link. It also means that what the regression equation ends up predicting using CGP score is not NCLEX exam score but the *probability of passing* the NCLEX exam. (Probability values here vary from 0 or no chance of passing through .5 or 50 percent chance to 1 or 100 percent likelihood).

REGRESSION OF CGP RAW SCORES ONTO NCLEX PASS RATE

	EC20	RC10	MC50
Score Range Possible Low - High	(20-71)	(20-60)	(28-74)
CGP Score:NCLEX Pass Probability (Slope)	1:.013	1:.010	1:.005
Coefficient of Correlation (r^2)	.094	.037	.012
Number of Test-Takers	(198)	(206)	(160)

The table suggests, using "slope" coefficients, that a good trend relationship exists between English CGP scores and first try NCLEX pass rate (1 score point up or down equals 1.3 pass chance percentage points in the same direction); and a fair relationship exists between reading CGP results and passing probabilty (1 CGP score point:1.1 pass chance percentage). No tie of any consequence, however, could be found between math CGP and pass rate (1:.5). But further examination shows even the English and reading test ties to be weak. For when we look at the correlation coefficients (r^2) for the three relationships, we see only the English CGP-NCLEX pass rate cross registering any genuine level of association. Its correlation was a real but anemic .09. The regression slope shows how the scores of one variable bear *on average* on the scores of another (the prediction of *y* from *x*). but it does not indicate how good a prediction of *y* for a *particular case* one is likely to get using that case's *x* value. If the dispersion of x-y case points about the mean trend line (slope) is great, predicting from the trend line means only a little improvement over mere guessing. In the contest of regression analysis, correlation coefficients (which vary from a random dispersion 0 to a perfect trend line fit 1) can be interpreted as measures of the predictive accuracy of the trend line.

The raw data relationship between EC20 score and NCLEX first attempt passing is graphically plotted below. In this case, NCLEX outcome is indicated by the percentages of students at each EC20 score point passing. This is statistically equivalent to the use of passing probabilities in the regression case but allows us to group students by CGP scores so that the effects of various CGP cutting points can be seen in terms of easily interpretatable NCLEX pass rates. This done, one can easily see that although poor EC20 performers were almost invariably first-time NCLEX failures, the relationship is only vague at the high end: many high score groups make quite disappointing showings.



For what it is worth, the graph also includes several vertical lines with special codes. For example, one is marked with a "77< >96." This means that the passing NCLEX percentage of all students scoring at or above the EC20 score cut by the line was 96 and that students with scores under the line cut score registered a collective pass rate of 77. The intention of these line was to enable the reader to play "what-if" games with the data: What if none of the students scoring below x on EC20 had taken the NCLEX – what then would have been our first try pass rate? Please note however that this is not the same as the "what-if" game "What if all students below EC20=x who needed remedial English had *completed* their requirement?" because the graph plots all NCLEX takers, including completers and incompleters. In fact, further analysis shows that "dropping" non-completers may not have made any difference since plotting their graph separately yielded approximately the same results!

3. How does the need to repeat nursing courses, particularly Nursing 152 on the way the Nursing 251, affect program progress and performance?

To begin with, just how much course-repeating behavior overall has there been recently among nursing program students? When one analyzes the "recidivist" tendencies of 1986-1992 students who had a chance to attempt all four core nursing program courses (55 percent of all), the following pattern emerges:

Core Course Taking 151-252

No Repeats (4 Enrollments)	72 %
1 Repeat (5 Enrollments)	20 %
2 Repeats (6 Enrollments)	5 %
3 Repeats (7 Enrollments)	3 %
4 Repeats (8 Enrollments)	<.5 %

Thus, it would seem that course recidivism is *not* a rampant phenomenon among nursing students; seven out of ten get by without having to repeat a single enrollment. But this finding, of course, applies only to our better nursing student (those who could get through at least three of the program's four core courses) and in any case does not necessarily imply that the recidivist phenomenon is evenly distributed across the four core courses or that its effects at certain critical stages of the program might not be damaging to many.

For a fuller analysis, we have to look at the effects of repeat course-taking for each individual core course. The following table shows core course repeating and completion (grade C or better) rates as assessed End Year 2:

	Nursing Course %			
	151	152	251	252
No Attempt*	--	[20]	[28]	[34]
1 Try	91	81	86	88
2+ Tries	9	19	14	13
Complete	86	91	93	94
Incomplete	14	9	7	6
1 Try/Complete	78	75	82	84
1 Try/Incomplete	13	6	4	3
2+ Tries/Completes	7	16	11	10
2+ Tries/Incomplete	2	3	3	3

* Bracketed %s are as against all Year 2 students (N=604); remaining %s as against enrolled students only

Nursing 152 does show up here as the most repeated core course (19 percent of enrollees; 15 percent of all End Year 2 students), five points higher than the next (Nursing 251) and about twice as repeat producing as Nursing 151. But if the first core course is not much of a repeater bottleneck it is probably because it is such a obstacle to progress of another kind. Nursing 151 acts as a dead end for a significant minority of students. Over 14 percent Nurse "wanabes" are stopped here, 13 percent almost before they started — in their first nursing program semester. The table also indicates that perseverance pays off. Around eight out of ten repeaters eventually achieve program acceptable grades.

The next table more deliberately explores the impact of core course recidivist and completion rates upon retention.

	% Types Dropping Out				% All (N=604) Dropping Out			
	151	152	251	252	151	152	251	252
No Attempt	--	98	94	92	--	--	--	--
1 Try	33	33	14	8	19	5	2	1
2+ Tries	36	36	34	20	2	3	1	1
Complete	23	23	11	4	7	3	1	<.5
Incomplete	97	97	85	78	14	5	3	1
1 Try/Complete	22	8	4	1	7	1	1	<.5
1 Try/Incomplete	100	83	83	50	13	4	2	1
2+ Tries/Completes	29	26	4	0	1	2	<.5	0
2+ Tries/Incomplete ...	70	92	71	46	1	1	1	1
Total End Course Lost..	--	--	--	--	21	7	4	2

The figures in the first half of this table represent the percentage of students in each recidivism/completion category dropping out at each core course level. For example, 97 percent of students failing to complete Nursing 151 dropped out. The second half shows the percentage of all End Year 2 students lost at each particular course level related to recidivism/completion category. Using the same example, students who failed to complete Nursing 151 and then dropped out equal 14 percent of all End Year 2 students. The example itself is a dramatic finding: 42 percent of End Year 2 drop outs (33 percent of all students drop out by semester 4) leave as a result of flubbing Nursing 151 — the very first course. Interestingly, another 7 percent of all students (21 percent of all dropouts) also leave at the 151 stage — even though they passed! From the standpoint of retention, Nursing 151 is the principle make-or-break course. All in all, one in five nursing students leave during the 151 interval, almost two-thirds of all dropouts. One thing that helps, however is repetition. Only 2 percent of all departing students (6 percent of all dropouts) were out-after-repeating-151 students.

Nursing 152 proved to be the No. 2 hurdle: its overall dynamics accounted for 21 percent of all dropouts; put another way, 7 percent of all entering nursing students are those reaching Nursing 152 but not going on to Nursing 251. But here also, first-time failures who try repeating mostly manage to stay with the program. As for the direct operation of Nursing 152 performance on 251 performance, we turned this up:

% Nursing 152 Enrollees not completing	15	(91)
even after repeating it	11	(71)
who stopped after 1st try	3	(20)
% Nursing 152 Enrollees completing	86	(535)
But not taking Nursing 251	2	(10)
And completing Nursing 251	70	(438)
who passed 152 on a repeat	8	(53)
who passed 152 on 1st try	62	(385)
Not completing Nursing 251	14	(87)
who passed 152 on a repeat	9	(56)
who passed 152 on 1st try	5	(31)
% ALL NURSING 152 ENROLLEES	100	(626)

Unsurprisingly, most students who took Nursing 152 passed (86 percent), and almost all who passed took 251, four-fifths of whom then in turn passed 251 (70 percent of the initial enrollees). The only somewhat interesting action on this table had to do with Nursing 152 repetition. When the data is reorganized, we find that 152-repeaters were much less likely to pass Nursing 251 than those who passed 152 on their first attempt — 49 percent to 93 percent, respectively. What weight should one give to this finding? Applied where the concern is over allocating scarce Nursing 251 classroom seats, the finding is of some consequence. Applied, however, to the "big picture" concern of pin-pointing major nursing program bottlenecks to student progress, the finding shrinks in importance because the phenomenon it identifies involved only 109 students out of 626 (17 percent), only 56 of whom actually stalled at this point (9 percent).

4. Does a gift for science aid help in pursuing PGCC's nursing program? How does performance on the two biology pre-requisites relate to nursing program success?

A simple start to answering this question is a straight-forward correlation of prerequisite science courses with cumulative mean nursing course grade, a rough-and-ready indicator of nursing program success. The table below shows r^2 nursing GPA correlations for all required biology and math courses as well as for other required courses — nine in all. The correlations are in rank-order, from highest to lowest:

Correlation of Final Grades with Nursing GPA (r^2)

Psychology 207 (Human Growth & Dev.)	.200
Biology 201 (Microbiology)	.181
Biology 101 (General Biology)	.178
Biology 105 (Human Anatomy I)	.112
English 102 (Composition II)	.103
Mathematics 112 (Math for General Studies)	.088
Biology 106 (Human Anatomy II)	.085
English 101 (Composition I)	.078
Psychology 101 (General Psychology)	.077

The most highly correlating performance in a non-nursing required course turned out to be that of Psychology 207 (Human Development); next were the correlations of three biology courses, suggesting that a science knack (or at least a biological one) is useful when pursuing an education in nursing. A closer look however indicates that none of these correlations is particularly strong. Even .2 represents an only slightly better than marginal link.

But perhaps giftedness in science (and other nursing-related areas) is too general a capability to be measured on a course-by-course performance basis. Maybe a conjoint correlation of such course indicators with nursing GPA would establish the link? The results of just such a multiple (stepwise) regression is shown next:

Multiple Stepwise Regression
of All Prerequisite Final
Grade with Nursing GPA

	Additive r^2 Contribution
Biology 201	.414
Biology 105	.107
Psychology 207	.077
Mathematics 112	.043
Conjoint R^2	.641

The multiple regression results lend credence to the science knack hypothesis: three of the four formula-surviving variables were science/math course grades and the multiple correlation coefficient proved to be a very robust .64. Unfortunately, the subsample size upon which the table is based contained fewer than 100 students (only those who had enrolled in *all* required courses); thus the subsample's behavior cannot be confidently generalized. Worse for the hypothesis' sake, a repetition of the regression analysis adding general cumulative GPA to the equation caused a jettisoning of *all* individual course variables leaving only general GPA. This suggests that nursing course performance is more related to general academic ability rather than to talent in any one area. And this is corroborated by the results of another regression analysis which correlated all-science course and all-requisite course mean GPAs with nursing GPA. This substitution preserved an adequate sample from which to generalize but the results were the same. When all-course GPA was introduced, all other grade variables dropped out.

The other way, of course, for the science requirement to effect nursing program progress is by means of the interaction of prerequisites with core course sequence. For example, nursing students may not take Nursing 252 before having completed Biology 201. How many students otherwise qualifying for Nursing 252 were prevented from enrolling because of lacking completion in the biology courses? The answer is 6 percent, which incidently is more than balanced by the 7 percent *not* Biology 201-qualified who were allowed into Nursing 252. The example typifies most requisite course-core course sequence interaction effects.

5. How well do those who "test out" of Nursing 151 tend to do once taking regular nursing program courses? And how about transfer students?

As we stated in the beginning of this report, transfer and "challenge" students were not to be included in normal nursing program outcomes analysis because their entries were just too irregular and their prior nursing background too difficult too assess. In any case, since 1986 there have been rather few of either kind — 46 transfers-in and 14 testeds-in to Nursing 151 (5 and 2 percent, respectively). These very small sub-sample sizes make for unstable outcome percentage estimates, unfortunately. But for what they are worth:

		Student Type		
	All	Reg	Trnsf	Chal
(At Least 4 Semesters)				
Mean Nursing GPA	2.41	2.40	2.41	2.85
Mean Total GPA	2.55	2.55	2.44	2.89
End Year 2				
% Dropouts	32	33	14	8
% Continuing	31	32	32	15
% Graduating	37	35	55	77
End Year 3				
% Dropouts	29	31	0	8
% Continuing	13	12	20	15
% Graduating	58	57	80	77
All P/F Reported 1986-1993				
% Passing NCLEX 1st Try	86	85	85	100
% Passing NCLEX Any Try	95	95	92	100

Sub-Samps.: GPA R=787,T=44,C=14/Yr2 R=604,T=22,C=13/
Yr3 R=485,T=15,C=13/LEX R=288,T=13,C= 9

On grades and NCLEX outcomes, transfer students are virtually indistinguishable from regular students, while "challenge" students as a group put in a genuinely superior performance. And as expected given their "head starts," transfer and "challenge" students prove much less likely to drop out and much more likely to graduate.

6. How many entering students each year should the nursing department accept were it to establish a target of 100 graduates per year?

During the 1986-1992 period, the annual nursing program intake of new students averaged 108. Also over this span, the mean Assessment Year 3 graduation rate was slightly under three-fifths. Thus, the standard size of the the nursing program graduating class came in at around 65 A.A. earners -- short 35 students from the question's target century. Put another way, to produce an average of 100 graduates per year, 167 students would have to enter the program annually. Such a calculation, of course, must be taken with extreme caution — if for no other reason (and there are many) that it assumes that 30 new students can be found each semester capable collectively of maintaining a 60 percent degree attainment rate.

Concluding General Observations

This preliminary investigation, driven by the specific issues raised by the Nursing Department, has raised as many questions as it has answered. In concluding, we would like just to note several findings of perhaps more general concern that attracted our attention in passing:

- *Nearly half of the students embarking on Nursing course study either avoided placement testing altogether or failed to complete required developmental coursework.*

- *Among those identified as needing remediation, completion of required developmental coursework yielded only modest gains in probability of graduating with a Nursing A.A.*

- *While most students who repeated a nursing course pass it the second time around, our data suggest that most of these will have trouble with the next course in sequence. For example, students who repeat Nursing 152 are half as likely to get through Nursing 251 as students succeeding in Nursing 152 on their first attempt.*

- *Graduates who required developmental coursework were less likely initially to pass the NCLEX examination than graduates not needing remediation. The NCLEX pass rate of non-developmental students was above the accepted standard of 90 percent. In contrast, graduates identified as needing remediation had a collective pass rate of 78 percent.*

We will be sure to probe these in more depth in the full evaluation.

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